

**DECEMBER 1997- MARCH 1998
SPECIAL CLIMATE AND WEATHER SUMMARY**

APRIL 7, 1998

**U.S. DEPARTMENT OF COMMERCE
NOAA/National Weather Service
NOAA/National Centers for Environmental Prediction
NOAA/Climate Prediction Center
NOAA/National Climatic Data Center**

DECEMBER, JANUARY, FEBRUARY, MARCH CLIMATE SUMMARY

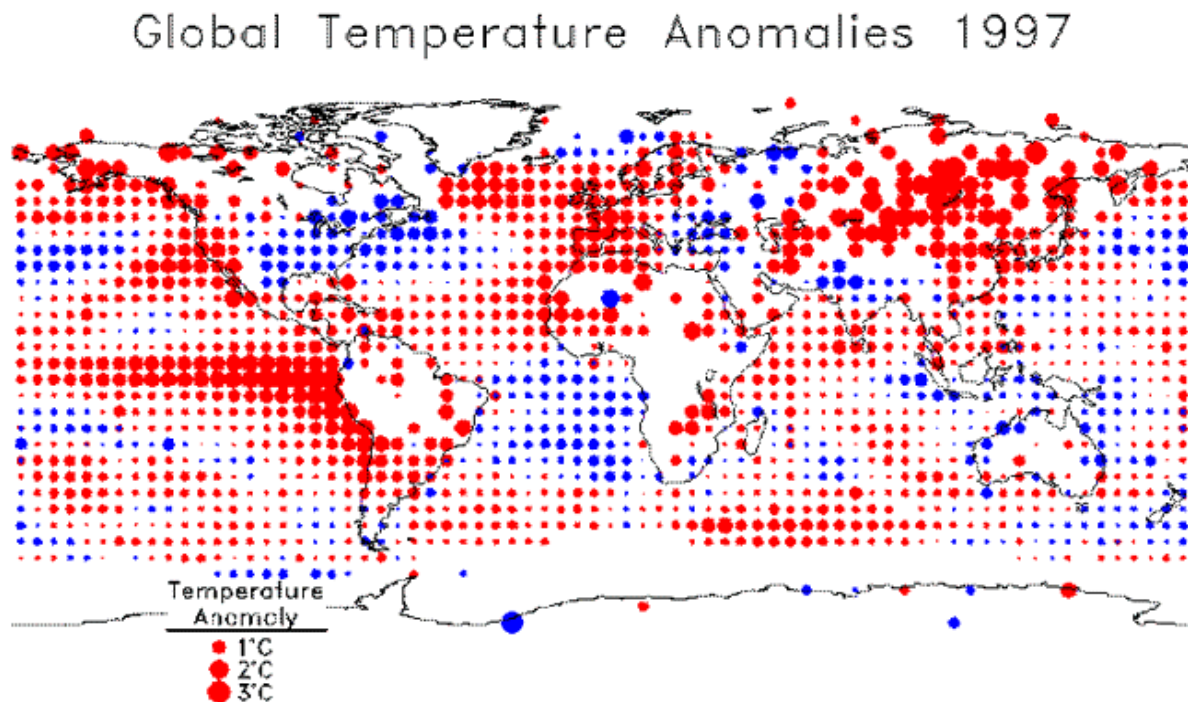
BACKGROUND

The 1997/98 El Niño ranks as one of the major climatic events of this century. Data tabulations, maps and time series of temperature and precipitation anomalies show the century-scale significance of the climate of 1997 and the December-January-February 1997-98 period for the U.S. and the globe. Throughout the winter a number of states and regions have experienced hundred year record rainfall and temperature.

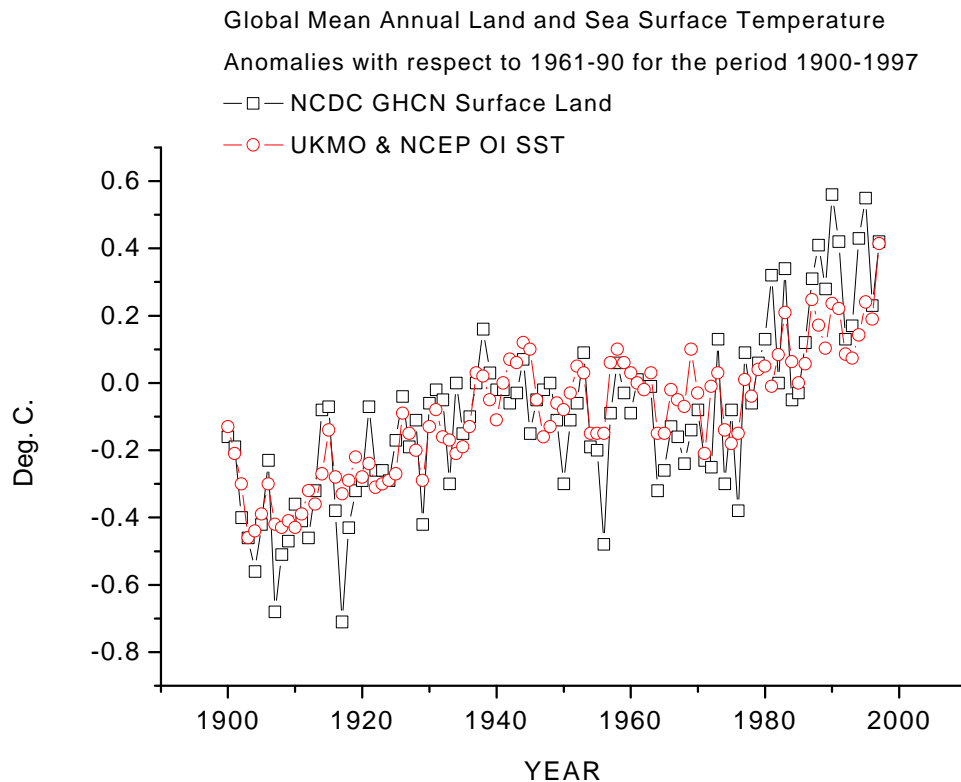
Forecasts that an El Niño was likely in 1997/98 were available in January 1997. The consistency of the forecasts through the spring and the ability to closely monitor the evolution of the ocean and atmosphere conditions allowed the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) to announce in June 1997 that this event would rank among the top three of the century in intensity and that major impacts could be expected in the U.S. and globally during the coming fall and winter. NOAA was confident enough to issue forecasts in summer 1997 that the southwest, California especially, and the southeast were under risk of well above normal rainfall and could undergo flooding events.

CLIMATE ANOMALIES AND CHANGES

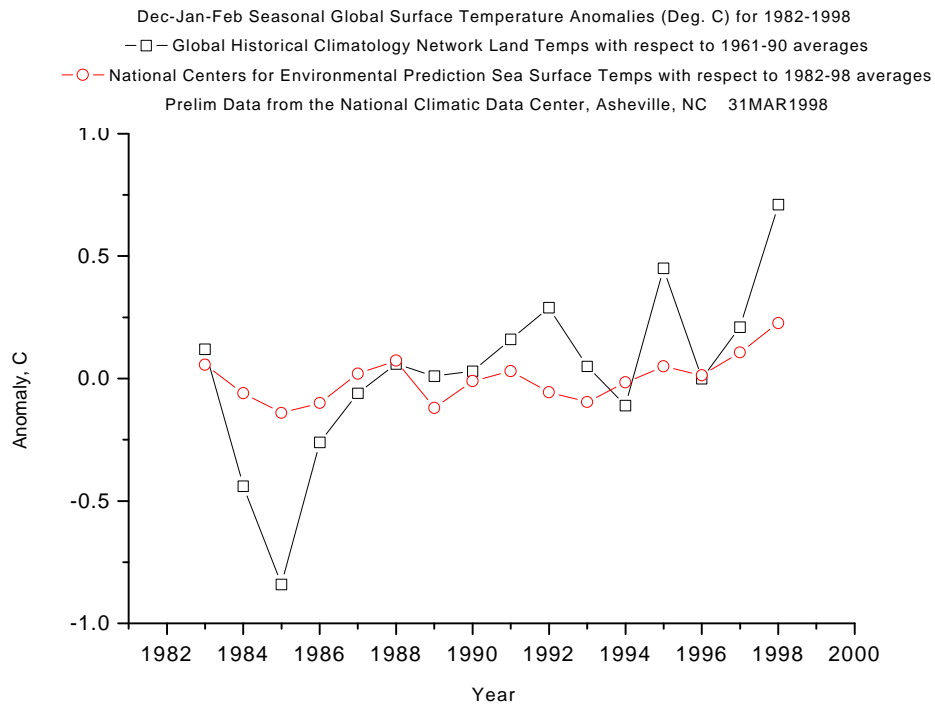
The 1997 and December-January-February 1997-98 period was exceptionally unusual for the U.S. and the globe from a century-scale perspective. The tendency toward a warmer, wetter world of recent decades has continued, amplified by the massive El Niño event. How the El Niño may be related to climate warming is not clear.



Map of 1997 Global Annual Surface Temperature Anomalies (Deg. C) based on Preliminary Data from the National Climatic Data Center, Asheville, NC. Closed (or red) dots indicate warm anomalies, and open (or blue) dots indicate cool anomalies. The size of the dot is proportional to the magnitude of the anomaly. For land areas, data are from the Global Historical Climatology Network and are with respect to 1961-90 averages. For the sea surface, data are from the National Centers for Environmental Prediction - Optimum Interpolation scheme and are with respect to 1982-98 averages.



Time series of 1997 Global Annual Surface Temperature Anomalies (Deg. C) based on Preliminary Data from the National Climatic Data Center, Asheville, NC. For land areas, data are from the Global Historical Climatology Network and are with respect to 1961-90 averages. For the sea surface, data are from the National Centers for Environmental Prediction - Optimum Interpolation scheme and are with respect to 1982-98 averages.



1997-98 Global December-January-February Surface Temperature Anomalies (Deg. C) based on Preliminary Data from the National Climatic Data Center, Asheville, NC. For land areas, data are from the Global Historical Climatology Network and are with respect to 1961-90 averages. For the sea surface, data are from the National Centers for Environmental Prediction - Optimum Interpolation scheme and are with respect to 1982-98 averages.

EL NIÑO FORECASTS

Strong El Niño conditions have persisted in the tropical Pacific Ocean since June 1997. Sea surface temperatures throughout the equatorial east-central Pacific increased to near 29°C during February and March 1998. At the same time, departures from normal were near +4°C along the west coast of South America. During 1997, NOAA's National Centers for Environmental Prediction (NCEP) statistical and coupled numerical model predictions were consistent in indicating the development and persistence of strong warm episode conditions. The latest NOAA forecasts indicate that warm episode oceanic conditions, comparable to those observed during 1982-83, will continue through June 1998. Thereafter, both the statistical model and the NCEP coupled numerical model indicate a return toward normal.

WINTER FORECASTS

The 1997/98 winter forecasts were made with unprecedented confidence because of the tools developed by NOAA's Climate Prediction Center. The December/January/February U.S. forecasts are the most successful seasonal forecasts ever issued by NOAA. The forecasts set new skill score records for temperature and precipitation for lead times out to 6.5 months.

HEATING DEGREE DAYS RESULT IN ENERGY SAVINGS

Based on heating degree days, the warm temperatures between December 1997 and February 1998 resulted in an average 15% energy savings across the country.

JANUARY AND FEBRUARY 1998 WARMEST AND WETTEST ON RECORD FOR COUNTRY

The first two months of 1998 were the warmest and wettest in the 104-year record of temperatures and precipitation measurements for the contiguous 48 states. During the period January-February the national average temperature was 37.5 degrees Fahrenheit compared with a normal of 32.1 degrees F. The previous record was 37.0 degrees F in 1990. For U.S.-wide average precipitation, 6.01 inches fell, compared with a normal of 4.05. The previous record was 5.7 inches in 1979.

U.S. WINTER RANKS AS 2ND WARMEST AND 7TH WETTEST ON RECORD

The 1997/98 winter as a whole (December through February) was the second warmest on record and the seventh wettest. The normal national average temperature for the winter months of December, January and February is 32.3 degrees F. This year's figure is 36.4 degrees F. The record is 36.6 degrees F set in 1991-1992. For the three-month period, the normal precipitation value for the country is 6.35 inches. This year's figure

is 7.96 inches, compared with 8.5 inches in 1932.

CALIFORNIA AND SOUTHEAST SET NEW RECORDS FOR RAINFALL

As predicted, much of California received between 150-300% of normal precipitation between December 1997 and March 1998, especially along the coastal areas south of San Francisco. In terms of actual rainfall totals, many areas, particularly the coastal areas and the High Sierra Mountains, received between 4 and 6 feet of rain during the four month period.

California February-Record Precipitation (Inches)

<u>Location</u>	<u>Total</u>	<u>Former Record/Year</u>
Ukiah	22.33	19.49 in 1958
Santa Barbara	21.74 *	17.33 in 1962
UCLA	20.51 *	18.37 in 1918
Chatsworth	20.11 *	17.71 in 1962
Oxnard	17.80	15.58 in 1962
Simi Valley	17.20 *	11.15 in 1992
Northridge	15.75 *	14.23 in 1962
Monterey	15.00	11.68 in 1978
San Francisco	14.89	12.52 in 1878
L.A. Civic Center	13.68	13.37 in 1884
L.A. Airport	13.30	11.07 in 1962
Lompoc	12.86	11.54 in 1918
Redwood City	12.46	10.06 in 1986
Santa Maria	11.59	9.69 in 1962
Long Beach	11.22	9.66 in 1937
San Jose	10.23	7.02 in 1915
Riverside	9.49 *	6.97 in 1969
Stockton	8.01	7.34 in 1936
Bakersfield	5.36 *	4.68 in 1978

* Denotes an all-time-record monthly total.

The southeastern United States also received above normal precipitation as forecast. Florida and parts of Oklahoma recorded over 200% of normal, with Tampa at 300% of normal. Up to 3 feet of precipitation was observed in portions of Florida and the Appalachians between December 1997 and March 1998. Areas of Kentucky and the Tennessee Valley saw below normal rainfall.

STATES/REGIONS SET PRECIPITATION AND TEMPERATURE RECORDS

Many states and region set precipitation and temperature records as outlined below.

December - February Precipitation

Rank	State/Rgn	Total	Normal	Pct. Of Normal	(Previous) Rec'd	Year		
1	FL	19.28	8.69	222	15.14	1963-64		
	GA	19.66	12.89	153	18.79	1963-64		
	SC	19.54	11.21	174	17.38	1981-82		
	<i>Southeast</i>	<i>18.57</i>	<i>11.60</i>	<i>160</i>	<i>16.55</i>	<i>1935-36</i>		
2	NC	17.66	11.32	156	18.22	1936-37		
3	OK	8.80	4.89	180	10.37	1984-85	(9.21	1992-93)
	VA	14.63	9.53	154	16.41	1936-37	(15.39	1978-79)
	USA	8.26	6.43	128	8.50	1931-32	(8.35	1936-37)

January-February Precipitation

Rank	State/Rgn	Total	Normal	Pct. Of Normal	(Previous) Rec'd	Year		
1	FL	11.67	6.12	191	11.59	1936		
	NC	13.72	7.70	178	11.93	1936		
	SC	14.34	7.63	188	13.10	1964		
	VA	11.83	6.38	185	11.40	1937		
	USA	6.01	4.19	143	5.70	1979		
2	RI	12.24	7.40	165	16.18	1979		
	<i>Southeast</i>	<i>13.30</i>	<i>7.90</i>	<i>168</i>	<i>13.50</i>	<i>1936</i>		
3	GA	13.42	8.86	151	14.80	1964	(14.80	1936)

February Precipitation

Rank	State/Rgn	Total	Normal	Pct. Of Normal	(Previous) Rec'd	Year		
1	CA	10.50	3.65	288	9.58	1986		
	ND	1.36	0.42	324	1.21	1922		
	<i>West</i>	<i>7.14</i>	<i>2.51</i>	<i>284</i>	<i>6.49</i>	<i>1986</i>		
2	FL	7.35	3.12	236	7.46	1983		
	MD	5.76	2.89	195	5.86	1979		
	NV	2.32	0.88	264	2.34	1962		
	RI	6.22	3.41	182	6.34	1984		
	VA	5.69	3.03	188	6.01	1897		
	USA	2.94	2.00	147	3.02	1903		
3	SC	7.30	3.75	195	8.86	1939	(7.60	1897)
	<i>Southeast</i>	<i>6.94</i>	<i>3.89</i>	<i>176</i>	<i>7.16</i>	<i>1903</i>	<i>(6.96</i>	<i>1939)</i>

December - February Temperatures

Rank	State/Rgn	Avg. T	Normal	Dep. From Normal	(Previous) Rec'd	Year		
1	CT	33.2	27.5	+5.7	33.0	1931-32		
	IA	29.2	21.3	+7.9	29.0	1991-92		
	MI	29.1	21.2	+7.8	28.7	1931-32		
	MN	23.4	11.6	+11.8	21.7	1986-87		
	NH	26.4	20.5	+5.9	26.2	1932-33		
	WI	26.4	16.6	+9.8	23.8	1930-31		
	<i>E. N. Central</i>	26.6	17.0	+9.6	24.5	1986-87		
2	DE	41.3	35.3	+6.0	43.2	1931-32		
	IL	35.1	28.3	+6.8	37.1	1931-32		
	IN	35.9	29.3	+6.6	38.2	1931-32		
	NJ	38.0	32.2	+5.8	38.9	1931-32		
	NY	28.9	22.7	+6.2	29.4	1931-32		
	OH	36.0	29.1	+6.9	38.4	1931-32		
	PA	34.3	27.8	+6.5	36.7	1931-32		
	<i>Northeast</i>	29.9	24.2	+5.7	30.7	1931-32		
	<i>Central</i>	37.6	32.2	+5.4	40.8	1931-32		
	USA	36.5	32.9	+3.6	36.6	1991-92		
3	MO	37.2	32.3	+4.9	40.0	1931-32	(37.9	1991-92)
	MD	39.5	34.0	+5.5	41.8	1931-32	(39.7	1948-49)

January-February Temperatures

Rank	State/Rgn	Avg. T	Normal	Dep. From Normal	(Previous) Rec'd	Year		
1	CT	33.8	26.4	+7.4	33.4	1990		
	IL	36.7	27.4	+9.3	36.1	1932		
	MI	28.8	19.7	+9.1	27.5	1932		
	MN	22.8	10.5	+12.3	22.8	1931		
	NH	26.8	19.3	+7.5	26.1	1937		
	NY	29.1	21.4	+7.7	29.1	1932	(29.1	1990)
	WI	26.3	15.5	+10.8	25.1	1931		
	<i>Northeast</i>	30.3	23.0	+7.3	30.2	1932		
	<i>E. N. Central</i>	26.5	15.9	+10.6	25.6	1931		
	USA	37.5	32.6	+4.9	37.0	1990		
2	IN	37.4	28.5	+8.9	37.6	1932		
	IA	30.0	20.5	+9.5	30.7	1931		
	MA	31.8	25.7	+6.1	31.9	1937		
	NJ	38.6	31.2	+7.4	38.7	1932	(38.6	1990)
	OH	37.3	28.2	+9.1	38.1	1932		
3	PA	35.2	26.8	+8.4	36.6	1932		
	RI	35.4	29.6	+5.8	36.1	1937		
	DE	42.0	34.5	+7.5	42.9	1932	(42.6	1990)
	MO	38.7	31.8	+6.9	39.6	1990	(39.0	1932)
	VT	24.4	17.3	+7.1	25.0	1937	(25.0	1933)
	<i>Central</i>	39.1	31.5	+7.6	40.3	1932	(39.5	1990)

February Temperatures

Rank	State/Rgn	Avg. T	Normal	Dep. From Normal	(Previous) Rec'd	Year		
1	CT	35.0	27.3	+7.7	34.6	1984		
	IL	40.6	29.5	+11.1	39.2	1954		
[tie]	IN	39.5	30.1	+9.4	39.5	1954		
	MI	31.4	20.3	+11.1	29.5	1984		
	MN	29.6	13.2	+16.4	27.7	1987		
	OH	38.8	29.4	+9.4	37.7	1930		
	PA	35.9	27.7	+8.2	34.7	1954		
	WI	31.4	17.4	+14.0	28.4	1954		
	<i>E. N. Central</i>	31.7	17.9	+13.8	29.6	1954		
2	IA	35.4	23.0	+12.4	35.9	1954		
	NY	30.4	22.0	+8.4	30.6	1984		
	ND	28.0	12.9	+15.1	29.7	1954		
	SD	33.1	20.9	+12.2	36.7	1954		
	<i>Northeast</i>	31.5	23.8	+7.7	31.6	1984		
3	NH	28.7	20.3	+8.4	29.6	1981	(29.0	1984)
	NJ	38.5	32.1	+6.4	38.9	1990	(38.8	1997)
	VT	26.5	18.2	+8.3	29.3	1981	(27.5	1984)

CITIES ACROSS COUNTRY SET NEW RECORDS

Individual cities across the country also set new records in temperature and precipitation in February and throughout the winter months (December - February). March was a highly variable month for most of the country. Early March temperatures in Chicago averaged below 20 degrees Fahrenheit and two weeks later were in the 70s. The same cold air mass dipped temperatures in Atlanta into the 30s in early March, with temperatures in the 70s two weeks later.

February-Record Precipitation (Inches)

<u>Location</u>	<u>Total</u>	<u>Former Record/Year</u>
Wilmington, NC	11.22	8.74 in 1983
Jacksonville, FL	11.12	9.16 in 1920
Tampa, FL	10.82	7.95 in 1963
Charleston, SC	10.17	6.35 in 1983
Norfolk, VA	8.21	7.33 in 1872
Roanoke, VA	8.00	7.17 in 1960
Dulles Airport, VA	5.81	5.75 in 1979
Salt Lake City, UT	4.89	3.22 in 1936
Las Vegas, NV	2.89	2.52 in 1993
Bismarck, ND	1.67	1.65 in 1987

Monthly temperatures ranged from 6 to 16°F above normal across the Nation's northern tier east of the Rockies, resulting in February-record average temperatures at about 20 locations from the Great Lakes region into the Northeast:

Record-Warm February (°F)

<u>Location</u>	<u>Average Temperature</u>	<u>Departure</u>	<u>Previous Record/Year</u>
Atlantic City Marina, NJ	43.0	N/A	42.0 in 1976
Newark, NJ	40.8	+ 7.8	40.8 in 1984
Allentown, PA	38.6	N/A	36.8 in 1954
Cleveland, OH	37.6	N/A	37.5 in 1930
Mansfield, OH	37.2	+10.2	34.6 in 1976
Williamsport, PA	37.0	+ 9.0	36.1 in 1954
Youngstown, OH	37.0	N/A	35.5 in 1984
Akron-Canton, OH	37.0	N/A	36.8 in 1890, 1976
South Bend, IN	37.0	N/A	not available
Rockford, IL	36.6	+13.7	34.7 in 1930
Toledo, OH	36.3	+11.1	not available
Hartford, CT	36.2	+ 8.7	36.2 in 1954
Erie, PA	35.7	N/A	35.5 in 1984
Muskegon, MI	35.0	+10.6	not available
Buffalo, NY	34.1	+ 9.5	33.8 in 1984
Green Bay, WI	N/A	N/A	not available
Houghton Lake, MI	30.2	+12.0	28.8 in 1954
Alpena, MI	29.7	+11.4	29.0 in 1954
Sault Ste. Marie, MI	29.1	+15.1	24.4 in 1954
Marquette, MI	28.4	+14.4	25.3 in 1984

The warmth resulted in much of the month's precipitation falling as rain in the Great Lakes and Midwestern States. February snowfall was the lowest on record in more than a dozen cities, including Buffalo, NY (1.8 inches), Houghton Lake, MI (1.4 inches), Dubuque, IA (0.2 inches), South Bend, IN (a trace), and Peoria, IL (none). Above-normal monthly temperatures also prevailed across the Northwest (departures of +2 to +5°F) and across the southern half of the Nation east of the Rockies (0 to +7°F). Near- to below-normal readings were restricted to California and the Southwest, where departures ranged from 0 to -4°F.

Dry weather continued in Hawaii through a fourth consecutive month. Conditions improved slightly toward month's end in Hilo, where more than 2 inches of rain during the last 13 days of February. Nevertheless, monthly rainfall was less than 25 percent of normal statewide. The dry weather led to some sharp temperature swings. For example, Kahului reported a daily-record low (53°F) on February 3, but a February-record-tying high (89°F) on February 12.

In Alaska, generally mild, dry weather prevailed. Temperature departures ranged from 0 to +9°F, including the second-warmest February on record in Juneau (37.2°F, 8.8° above normal). A brief mid-month cold snap across the north sent temperatures on the 17th to -62°F in Umiat and -49°F in Prudhoe Bay. February snowfall was the second lowest on record in McGrath (0.5 inches) and third lowest in Juneau (0.5 inches).

MARCH CONTINUES EL NINO PATTERN

The weather patterns associated with El Niño that dominated much of the winter months continued in March 1998. The southern tier of the United States remained slightly cooler than normal while the northern third of the country was warmer than normal. On a whole, the historical temperature ranking was average (48 out of 104 years of record.) Overall, March continued to be wet across much of the U.S. The nation observed the 6th wettest March on record since 1895.

Selected Record Wet March (Inches)

<u>Location</u>	<u>Total</u>	<u>Previous Record</u>
Sioux Falls, SD	4.07	4.06 set in 1995
Kodiak, AK	12.73	NA
Madison, WI	5.46	5.04 set in 1973
Alpena, MI	7.32	5.56 set in 1886

March was the second driest on record in Anchorage, Alaska, with less than a tenth of an inch of precipitation. The driest March occurred in 1983 when only a trace of precipitation fell. Below average precipitation occurred across Hawaii throughout most of March causing drought conditions to continue.

Selected All Time Record High Temperature Readings for March

<u>Location</u>	<u>Temperature</u>	<u>Previous Record</u>
Massena, NY	85	67 in 1982
Montpelier, VT	80	68 set in 1968
St. Johnsbury, VT	83	67 set in 1968
Burlington, VT	84	71 set in 1949
Concord, NH	86	82 set in 1945
Boston, MA	89	NA
Blue Hills Obs., MA	86	85 set in 1945
Allentown, PA	87	84 set in 1977
Wilkes Barre, PA	84	84 set in 1905
Binghamton, NY	82	82 set in 1977
Wilmington, DE	86	NA
Harrisburg, PA	87	86 set in 1945
Albany, NY	89	86 set in 1986
Windsor Locks, CT	89	87 set in 1977
Juneau, AK	61	59 set in 1981

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